Phys 590B Special Topics Condensed Matter Physics—Experimental Methods.

MWF 9-10
Room 401 Zaffarano

This course will consist of lectures given by members of the Ames Lab and ISU CMP program and it is meant to codify many of the "details" that are never covered in more formal, theoretical reviews of these topics.

Lectures will primarily be power point presentations, which we plan to post on the Canfield group web site, augmented by black board work.

August 25 – 29: Introduction, basic measurement, cryogenics P. Canfield, S. Bud'ko

Sept. 1-3: Measurement of temperature M. Tanatar, R. Prozorov

Sept. 8-12: Low Pressure -- Vacuum generation, gauging and use. A. Kaminski, M. Hupalo

Sept. 15 – 19: High Pressure generation, gauging and use for synthesis and measurements. S. Bud'ko

Sept. 22 – 26: Elastic scattering of X-rays and neutrons PART 1: basics technique, lab sources versus user facilities. A. Goldman, A. Kreyssig, R. McQueeney

Sept. 29 – Oct. 3: Elastic scattering of X-rays and neutrons PART 2: More advanced discussions about specific measurements, comparisons of strengths and weaknesses, etc. A. Goldman, A. Kreyssig, R. McQueeney

Oct. 8 – 12: E and H field generation and measurement. R. Prozorov, S. Bud'ko, A. Kaminski

Oct. 13 – 17: Catch up, review, and mid-term exam on Friday, October 22.

Oct. 20 – 24: Magnetization (d.c. and a.c.) PART 1: Measurement techniques and basic use. R. Prozorov

Oct. 27 – 31: Magnetization (d.c. and a.c.) PART 2: Field and dependent measurements Phase diagrams, etc. R. Prozorov

Nov. 3 – 7: Specific heat and other calorimetry. S. Bud'ko, R. W. McCallum

Nov. 10 – 14: V, I, R measurements: how to generate and measure quantities and then how to get data (resistivity, mag-res, Hall). M. Tanatar

Nov. 17 – 21: Other transport measurements (thermal conductivity and thermopower) M. Tanatar

Nov. 24 – 28: NO CLASSES

Dec. 1 -5: Catch up, and discussions of current papers.

Dec. 8 – 12: Discussions of current papers and review

Dec. 15 – 19: Final exam week

The final grade for the course will be based on the mid-term exam (30%), the final exam (50%) and classroom participation / evaluation (20%). There may be an in class quiz, depending on time and the instructors' sense of the class progress.

This is the first semester of an experimental course. We will be hoping for constructive feed back about the material presented in this semester as well as suggestions for topics to be covered in a second semester of more advance topics such as:

-- Review and broad lectures on importance of Fermi surface and DOS with lectures on quantum oscillations

-- ARPES and positron annihilation with some band structure as needed

-- NMR

-- Inelastic scattering

-- Mossbauer and μSR as well as what ever else.

-- Sample growth --- phase diagrams and growth techniques

-- Etc.

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